

EXHIBIT 16

SERIAL NUMBER (Series of 1987) 07/521618		PATENT DATE 05/10/93		PATENT NUMBER 5252652	
SERIAL NUMBER 07/521618		FILING DATE 05/10/93		CLASS 273524	
SUBCLASS 273524		SUBCLASS 273524		GROUP/ART UNIT 159B	
APPLICANTS YOSHINORI EGASHIRA, SAITAMA-KEN, JAPAN; KAZUYUKI TAKAHASHI, YOKOHAMA, JAPAN; SEISUKE TOMITA, TOKOROZAWA, JAPAN.					
CONTINUING DATA*** VERIFIED Q.R. KM					
FOREIGN/PCT APPLICATIONS*** VERIFIED JAPAN 1-118460 11/05/89 Q.R. KM					
Foreign priority claimed 35 USC 119 conditions met <input checked="" type="checkbox"/> yes <input type="checkbox"/> no Verified and Acknowledged <input checked="" type="checkbox"/> yes <input type="checkbox"/> no Examiner's Initials Q.R. KM		AS FILED STATE OR COUNTRY JPX		SHEETS DRWGS 1	
TOTAL CLAIMS 6		INDEP CLAIMS 1		FILING FEE RECEIVED \$ 370.00	
ATTORNEY'S DOCKET NO. 023105		ADDRESS SUGHRUE, MION, ZINN, MACPEAK & SEAS 2100 PENNSYLVANIA AVE., N.W. WASHINGTON, DC 20037			
TITLE SOLID GOLF BALL					
U.S. DEPT. of COMM. - Pat. & TM Office - PTO-438L (rev. 10-78)					
PARTS OF APPLICATION FILED SEPARATELY					
NOTICE OF ALLOWANCE MAILED 4/9/93 35-21-93		PREPARED FOR ISSUE Assistant Examiner Kneillion S. Morgan KNEILLION'S MORGAN PRIMARY EXAMINER ART UNIT 159B Primary Examiner		CLAIMS ALLOWED Total Claims 13 Print Claim 1	
ISSUE FEE Amount Due 1170.00 Date Paid 7-09-93		DRAWING Sheets Drwg. 4 Figs. Drwg. 2 Print Fig. 1		ISSUE CLASSIFICATION Class 524 Subclass 392	
Label Area		ISSUE BATCH NUMBER M11		WARNING: The information disclosed herein may be restricted. Unauthorized disclosure may be prohibited by the United States Code Title 35, Sections 122, 181 and 368. Possession outside the U.S. Patent & Trademark Office is restricted to authorized employees and contractors only.	

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	2. <u>Priority Papers</u>	<u>5-10-90</u>
<u>12/3/90</u>	3. <u>by (3 mos)</u>	<u>12 DEC 1990</u>
<u>4/22/91</u>	4. <u>Req. for ext of time (1 mo)</u>	<u>4/12/91</u>
<u>4/22/91</u>	5. <u>Declaration</u>	<u>4/12/91</u>
<u>4/22/91</u>	6. <u>Amtd A</u>	<u>4/12/91</u>
<u>6/28^R</u>	7. <u>Req (3 mos)</u>	<u>7/8/91</u>
	8. <u>Amtd B</u>	<u>Oct 8, 91</u>
<u>11/26^R</u>	9. <u>FINAL REJECTION</u>	<u>12/17/91</u>
	10. <u>Req. ext. of time 1 mo.</u>	<u>April 13, 92</u>
	11. <u>Declaration</u>	<u>April 13, 92</u>
	12. <u>Amtd. C</u>	<u>April 13, 92</u>
	13. <u>Notice of Appeal</u>	<u>April 13, 92</u>
<u>4/28 H</u>	14. <u>Req (3 months)</u>	<u>05-05-92</u>
	15. <u>Declaration</u>	<u>Aug. 5, 92</u>
	16. <u>Response</u>	<u>Aug. 5, 92</u>
<u>10/5 T</u>	17. <u>FINAL REJECTION (3 mos)</u>	<u>Oct 13/92</u>
	18. <u>Req. ext. of time (1 mo)</u>	<u>Mar. 12, 93</u>
	19. <u>Amtd. D N/E</u>	<u>Mar. 12, 93</u>
	20. <u>Notice of Appeal</u>	<u>Mar. 12, 93</u>
<u>4/9</u>	21. <u>Notice of Allowance</u>	<u>4/9/93</u>
	22. <u>Amtd. E (3/12)</u>	<u>April 13, 93</u>
<u>4/29</u>	23. <u>Notice of Entry</u>	<u>5-21-93</u>
	24. <u>Suppl. Notice of Allowance</u>	<u>5-21-93</u>
	25. <u>PTO GRANT MAY 12 1993</u>	
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US003252652A

United States Patent [19]

Egashira et al.

[11] **Patent Number:** 5,252,652[45] **Date of Patent:** Oct. 12, 1993[54] **SOLID GOLF BALL**

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Seisuke Tomita, Tokorozawa, all of
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[73] **Assignee:** Bridgestone Corporation, Tokyo,
Japan

[21] **Appl. No.:** 521,618[22] **Filed:** May 10, 1990[30] **Foreign Application Priority Data**

Nov. 5, 1989 [JP] Japan 1-118460

[51] **Int. Cl.³** C08K 5/09; C08K 5/36;
A63B 37/00[52] **U.S. Cl.** 524/392; 524/289;
524/382; 524/908; 273/218[58] **Field of Search** 524/908, 289, 382, 392[56] **References Cited****U.S. PATENT DOCUMENTS**

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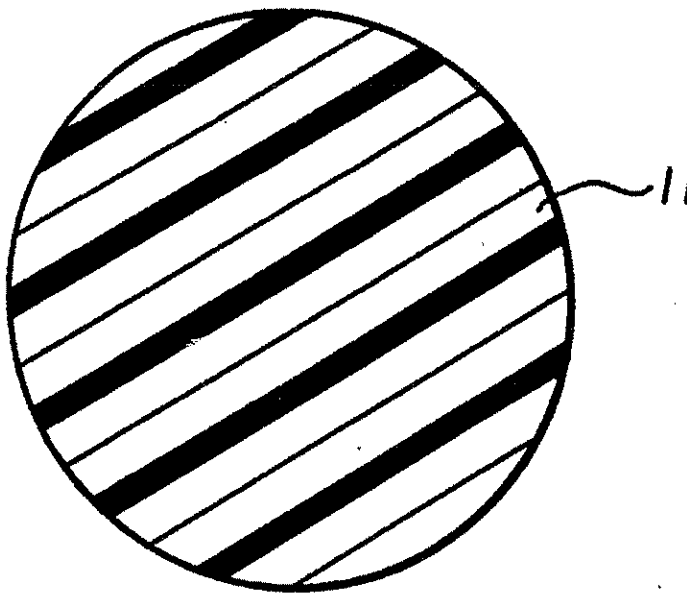
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Primary Examiner—Kriellion S. Morgan
Attorney, Agent, or Firm—Sughrue, Mion, Zinn,
Macpeak & Seas

[57] **ABSTRACT**

One-piece and multi-layered golf balls are improved in flying performance by forming the one-piece ball entirely or multi-layered golf ball core from a rubber composition comprising a base rubber, an unsaturated carboxylic acid metal salt, and an organic sulfur compound and/or a metal salt thereof.

13 Claims, 1 Drawing Sheet



U.S. Patent

Oct. 12, 1993

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FIG. 1

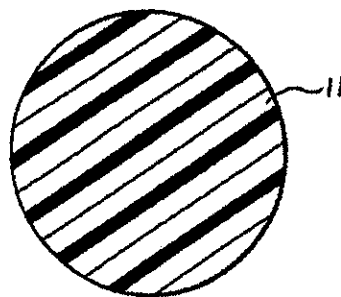
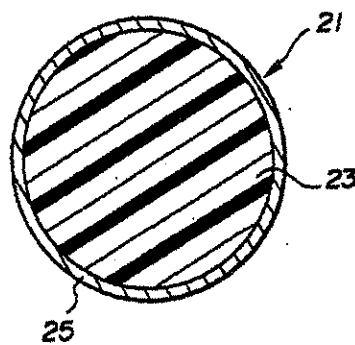


FIG. 2



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1 SOLID GOLF BALL

This invention relates to solid golf balls having improved flying performance.

BACKGROUND OF THE INVENTION

In general, solid golf balls include a one-piece golf ball which is integrally molded in its entirety a two-piece golf ball having a core enclosed in a cover, and a multi-layered golf ball having a core enclosed in a cover through one or more intermediate layers.

These solid golf balls have an elastic portion in the form of a molded and vulcanized rubber compound as a portion, that is, a core in the case of multi-layered golf balls or as their entirety in the case of one-piece golf balls. For the purpose of improving the repulsion coefficient and impact resistance of the prior art rubber compositions from which the elastic portion was formed, attempts were made to blend a monomer having an unsaturated bond, typically an α,β -ethylenically unsaturated carboxylic acid metal salt as a co-crosslinking agent in polybutadiene or a similar base rubber. The co-crosslinking agent will graft or crosslink to the backbone of polybutadiene rubber under the action of a peroxide or similar co crosslinking initiator, resulting in a three-dimensional crosslinked polymer, which can provide an adequate degree of hardness and durability for one-piece golf balls or multi-layered golf ball cores. Therefore, one-piece golf balls formed from rubber compositions having such a co-crosslinking agent blended and multi-layered golf balls having cores formed from rubber compositions having such a co-crosslinking agent blended are known to exhibit satisfactory flying performance and durability.

Golf players have a continuous demand for better flying performance and it is thus desired to develop golf balls having further improved flying performance.

SUMMARY OF THE INVENTION

Therefore, an object of the invention is to provide a golf ball having further improved flying performance.

Searching for an optimum additive for a rubber composition containing a base rubber, typically polybutadiene and an unsaturated carboxylic acid metal salt as a co-crosslinking agent, the inventors have found that when an organic sulfur compound and/or a metal-containing organic sulfur compound is added to the rubber composition, there is obtained a rubber composition which can be vulcanized into a rubbery elastomer having improved rebound resilience. If a one piece golf ball or a multi-layered golf ball core is formed from this rubber composition, the resulting solid golf ball exhibits an increased initial velocity upon hitting and improved flying performance. The present invention is predicated on this finding.

According to the present invention, there is provided a solid golf ball comprising a rubber composition containing a base rubber, an unsaturated carboxylic acid metal salt, and a sulfur compound selected from the group consisting of an organic sulfur compound and a metal-containing organic sulfur compound.

In one form, the ball is a one-piece golf ball which is entirely formed of the present rubber composition.

In another form, the ball is a multi-layered golf ball comprising a core and a cover enclosing the core, wherein the core is formed of the present rubber com-

position. The core may be enclosed in the cover directly or through an intermediate layer.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross section of a one-piece golf ball.

FIG. 2 is a cross section of a two-piece golf ball.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 shows in cross section a one-piece golf ball 11. FIG. 2 shows a two-piece golf ball 21 comprising a core 23 coated with a cover 25. A plurality of, usually 200 to 600, dimples are formed on the surface of the golf balls, although they are not shown in FIGS. 1 and 2.

The solid golf ball of the present invention is a one piece golf ball or a multi-layered golf ball in which the one-piece golf ball or the core of the multi-layered golf ball is formed from a rubber composition comprising a base rubber, an unsaturated carboxylic acid metal salt, and an organic sulfur compound and/or a metal-containing organic sulfur compound.

The base rubber used herein may be any desired rubber which is commonly used in conventional one-piece golf balls and cores of multi-layered golf balls. Polybutadiene rubbers, especially poly(1,4-butadiene) rubbers containing at least 40 mol %, preferably 80 to 100 mol % of cis-1,4 bond are preferred because of high rebound resilience, extrusion moldability, and high strength after vulcanization. If desired, the poly(1,4-butadiene) rubbers may be blended with natural rubber, polyisoprene rubber, styrene-butadiene rubber or the like. It is desired that at least 80% by weight of poly(1,4-butadiene) rubber be present in the base rubber because base rubbers containing less amounts of poly(1,4-butadiene) rubber often fail to take advantage of the rebound resilience of polybutadiene rubber.

The metal salt of unsaturated carboxylic acid is blended as a co-crosslinking agent. Examples include zinc and magnesium salts of unsaturated fatty acids having 3 to 8 carbon atoms, such as acrylic acid, methacrylic acid, maleic acid, and fumaric acid, with the zinc salts of acrylic and methacrylic acid being most preferred. The unsaturated carboxylic acid metal salt may be blended in a rubber either as a preformed metal salt or by introducing an α,β -unsaturated carboxylic acid and a metal oxide or hydroxide into the rubber composition and allowing them to react in the rubber composition to form a metal salt. The unsaturated carboxylic acid metal salt may be blended in any desired amount, but preferably in amounts of about 25 to about 40 parts by weight per 100 parts by weight of the base rubber.

The rubber composition used in the manufacture of the solid golf ball of the invention contains an organic sulfur compound and/or a metal-containing organic sulfur compound in addition to the base rubber and the unsaturated carboxylic acid metal salt. Examples of the organic sulfur compound include thiophenols such as pentachlorothiophenol, 4-butyl-o-thiocresol, 4 t-butyl-p-thiocresol, and 2-benzamidothiophenol, thiocarboxylic acids such as thio-benzoic acid, and sulfides such as dicyllyl disulfide, di(o-benzamidophenyl) disulfide and alkylated phenol sulfides. Examples of the metal-containing organic sulfur compound include zinc salts of the above-mentioned thiophenols and thiocarboxylic acids. The sulfur compounds may be used alone or in admixture of two or more of them. The sulfur compound is preferably blended in amounts of from about 0.05 to about 2 parts by weight, more preferably from

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about 0.1 to about 0.5 parts by weight per 100 parts by weight of the base rubber.

The rubber composition of the invention may further contain a co-crosslinking initiator. Preferred examples of the co-crosslinking initiator include organic peroxides, such as dicumyl peroxide, *t*-butylperoxybenzoate, di-*t*-butylperoxide, 1,1-bis(*t*-butylperoxy)-3,3,5-trimethyl-cyclohexane, *n*-butyl-4,4-bis(*t*-butylperoxy)valerate, 2,2-bis(*t*-butylperoxy-isopropyl)benzene, and 2,5-dimethyl-2,5-di(*t*-butylperoxy)hexane, with the dicumyl peroxide being most preferred. The initiator may be blended in amounts of about 0.5 to about 3 parts by weight, preferably about 1 to about 2.5 parts by weight per 100 parts by weight of the base rubber.

Also employable is a filler. Preferred examples of the filler include metal oxides such as zinc oxide and magnesium oxide. It may be blended in amounts of about 10 to about 80 parts by weight per 100 parts by weight of the base rubber. If desired, the rubber composition can additionally contain a plasticizer, an antioxidant, and any other additives which are generally employed in the preparation of one-piece balls or cores of multi-layered balls. Their amounts may be determined without undue experimentation.

The solid golf ball of the invention may be prepared by molding the above-formulated rubber composition as formulated above into a desired spherical shape, that is, a ball in the case of a one-piece ball or into a core in the case of a multi-layered ball and vulcanizing the rubber by heating. The manufacture may be in accord with conventional method and conditions.

When multi-layered golf balls such as two-piece balls are manufactured, the core is coated with a cover. The cover material used herein may be selected from commonly used cover materials, for example, ionomers such as Surlyn®, polyesters, and nylons. The cover usually has a thickness of 0.5 to 2.5 mm.

The core may be enclosed in the cover directly or through an intermediate layer.

The present invention may be applied to any type of golf ball including small balls having a diameter of at least 41.15 mm and a weight of up to 45.92 g, and large balls having a diameter of at least 42.67 mm and a weight of up to 45.92 g.

The distribution and total number of dimples are not critical although 300 to 550 dimples, preferably 350 to 540 dimples are generally formed on a ball. Preferred dimple arrangements are regular icosahedral, regular dodecahedral, and regular octahedral arrangements. The dimples is preferably distributed uniformly on the ball surface in such an arrangement.

The solid golf balls of the invention are of the above-mentioned construction and exhibit excellent flying performance.

EXAMPLE

Examples of the invention are given below together with comparative examples by way of illustration and not by way of limitation.

EXAMPLES 1-6

Solid cores for two-piece golf balls were prepared and compared with conventional two-piece golf ball cores.

Six rubber compositions were prepared by mixing the ingredients shown in Table 1. A two-piece golf ball-forming solid core having a diameter of 38.0 mm was prepared by molding each of the compositions in a mold

followed by vulcanization at 155° C. for 20 minutes. The cores were examined by a hitting test according to the USGA standard. Using a hitting machine of the flywheel type, the cores were hit at a head speed of 38 m/sec. to measure the initial velocity (in m/sec.). The results are shown in Table 1.

TABLE 1

	Core No.					
	1	2	3	4*	5*	6*
Ingredients (phw)						
Poly(cis-1,4-butadiene)	100	90	80	100	90	80
Poly(cis-isoprene)	0	10	20	0	10	20
Zinc acrylate	32	32	32	32	32	32
Zinc oxide	21	21	21	21	21	21
Antioxidant	0.2	0.2	0.2	0.2	0.2	0.2
Dicumyl peroxide	1.5	1.5	1.5	1.5	1.5	1.5
Pentachlorothiophenol zinc salt	0.2	0.2	0.2	0	0	0
Initial velocity, m/sec.	73.32	73.11	72.80	72.95	72.67	72.30

*outside the scope of the invention

As seen from Table 1, the performance, that is, initial velocity upon hitting of the core is improved by blending zinc salt of pentachlorothiophenol which is a metal salt of an organic sulfur compound in a rubber composition.

Examples 7 and 8

Two rubber compositions were prepared by blending the ingredients shown in Table 2. Two-piece golf ball solid cores having a diameter of 38 mm were prepared by molding the composition in a mold and vulcanizing at 155° C. for 20 minutes. An ionomer resin composition was applied to the cores to form a cover thereon. There were obtained two-piece golf balls having a diameter of 42.7 mm.

The balls were measured for weight, hardness and initial velocity. The hardness of the balls was measured as a deflection (in mm) under a load of 100 kg. The initial velocity (in m/sec.) of the balls was measured by a hitting test according to the USGA standard in which the balls were hit at a head speed of 38 m/sec. using a hitting machine of the flywheel type. The results are shown in Table 2.

TABLE 2

	Example	
	7	8*
Core composition (phw)		
Poly(cis-1,4-butadiene) rubber	100	100
Zinc acrylate	32	32
Zinc oxide	21	21
Antioxidant	0.2	0.2
Dicumyl peroxide	1.5	1.5
Pentachlorothiophenol zinc salt	0.2	—
Ball properties		
Weight, g	45.3	45.3
Hardness	2.30	2.32
Initial velocity, m/sec.	73.37	72.84

*outside the scope of the invention

As seen from Table 1, the golf balls of the invention are improved in initial velocity upon hitting and hence, in flying performance.

Although some preferred embodiments have been described, many modifications and variations may be made thereto in the light of the above teachings. It is therefore to be understood that within the scope of the

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appended claims, the invention may be practices otherwise than as specifically described.

We claim:

1. A solid golf ball, having an improved rebound property and initial velocity, comprising a rubber composition containing 100 parts by weight of a base rubber selected from the group consisting of polybutadiene rubber, natural rubber, polyisoprene rubber and styrene-butadiene rubber, about 25 to about 40 parts by weight of a zinc or magnesium salt of an unsaturated fatty acid having 3 to 8 carbon atoms, about 0.05 to about 2 parts by weight of a sulfur compound selected from the group consisting of pentachlorothiophenol, 4-t-butyl-o-thiocresol, 4-t-butyl-p-thiocresol, 2-benzamidothiophenol, thiobenzoic acid, and zinc salts thereof, and about 0.5 to about 3 parts by weight of an organic peroxide.

2. The solid golf ball of claim 1, wherein said solid golf ball is a one-piece golf ball which is formed of said rubber composition.

3. The solid gold ball of claim 1, wherein said solid golf ball core and a cover enclosing the core, and said core is formed of said rubber composition.

4. The solid golf ball of claim 3, wherein said solid golf ball is a two-piece ball, and said core is directly enclosed in the cover.

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5. The solid gold ball of claim 3, wherein said solid golf ball further comprises an intermediate layer between the core and the cover.

6. The solid golf ball of claim 1, wherein said base rubber is a polybutadiene rubber.

7. The solid gold ball of claim 6, wherein said polybutadiene rubber is a poly(1,4-butadiene) rubber containing at least 40 mol % of cis-1,4 bond.

8. The solid golf ball of claim 7, wherein said poly(1,4-butadiene) rubber contains at least 80 to 100 mol % of cis-1,4 bond.

9. The solid golf ball of claim 7, wherein said base rubber comprises at least 80% by weight of said poly(1,4-butadiene) rubber.

10. The solid golf ball of claim 9, wherein said poly(1,4-butadiene) rubber is blended with a natural rubber, a polyisoprene rubber of a styrene-butadiene rubber.

11. The solid gold ball of claim 1, wherein said sulfur compound is blended in an amount of from about 0.1 to about 0.5 parts by weight.

12. The solid golf ball of claim 1, wherein said organic peroxide is selected from the group consisting of dicumyl peroxide, t-butylperoxybenzoate, di-t-butylperoxide, 1,1-bis(t-butylperoxy)-3,3,5-trimethylcyclohexane, n-butyl-4,4-bis(t-butylperoxy)valerate, 2,2'-bis(t-butylperoxyisopropyl)benzene, and 2,5-dimethyl-2,5-di(t-butylperoxy)hexene.

13. The solid golf ball of claim 1, wherein said rubber composition further comprises a filler.

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May 10, 1990

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231Re: Application of YOSHINORI EGASHIRA, KAZUYUKI TAKAHASHI
AND SEISUKE TOMITA
"SOLID GOLF BALL"
Our Ref.: Q-23105

Dear Sir:

Attached hereto is the application identified above including the specification, claims, declaration and power of attorney, one priority document, one sheet of formal drawings and an assignment.

The Government filing fee is calculated as follows:

Total claims	6 - 20 = 0	x \$12 =	00.00
Independent claims	1 - 3 = 0	x \$36 =	00.00
Base fee			370.00
Multiple dependent claim fee (\$120.00)			00.00
Assignment Recordation fee			8.00
	SUBTOTAL ...		378.00
TOTAL FILING FEE			\$378.00

Kindly charge the statutory fee of \$378.00 to our Deposit Account 19-4880. You are also directed and authorized to charge or credit any difference or overpayment to said Account. The Commissioner is hereby authorized to charge any fees under 37 CFR 1.16 and 1.17 which may be required during the entire pendency of the application to Deposit Account No. 19-4880.

Priority is claimed from May 11, 1989 based on Japanese Patent application Serial No. 1-118460.

Respectfully submitted,

SUGHRUE, MION, ZINN,
MACPEAK & SEAS
Attorneys for Applicant(s)

By:

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WAB/drl

521618

A



S P E C I F I C A T I O N

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN THAT WE, Yoshinori EGASHIRA, Kazuyuki
TAKAHASHI and Seisuke TOMITA, residing at No. 6-6
Musashidai 7-chome, Hidaka-machi, Iruma-gun, Saitama-
ken, JAPAN, No. 150-7, Kashio-cho, Totsuka-ku,
Yokohama-shi, Kanagawa-ken, JAPAN and No. 3-7,
Matsugaoka 1-chome, No. 151-15, Kume, Tokorozawa-shi,
Saitama-ken, JAPAN, respectively, have invented
certain new and useful improvements in

"Solid Golf Ball" 501

of which the following is a specification:-



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TITLE OF THE INVENTION

Solid Golf Ball

5 This invention relates to solid golf balls having improved flying performance.

BACKGROUND OF THE INVENTION

10 In general, solid golf balls include a one-piece golf ball which is integrally molded in its entirety, a two-piece golf ball having a core enclosed in a cover, and a multi-layered golf ball having a core enclosed in a cover through
15 one or more intermediate layers.

These solid golf balls have an elastic portion in the form of a molded and vulcanized rubber compound as a portion, that is, a core in the case of multi-layered golf balls or as their entirety in the case of one-piece golf
20 balls. For the purpose of improving the repulsion coefficient and impact resistance of the prior art rubber compositions from which the elastic portion was formed, attempts were made to blend a monomer having an unsaturated bond, typically an α,β -ethylenically unsaturated carboxylic
25 acid metal salt as a co-crosslinking agent in polybutadiene or a similar base rubber. The co-crosslinking agent will graft or crosslink to the backbone of polybutadiene rubber under the action of a peroxide or similar co-crosslinking initiator, resulting in a three-dimensional crosslinked
30 polymer, which can provide an adequate degree of hardness and durability for one-piece golf balls or multi-layered golf ball cores. Therefore, one-piece golf balls formed from rubber compositions having such a co-crosslinking agent blended and multi-layered golf balls having cores formed
35 from rubber compositions having such a co-crosslinking agent

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blended are known to exhibit satisfactory flying performance and durability.

Golf players have a continuous demand for better flying performance and it is thus desired to develop golf balls having further improved flying performance.

SUMMARY OF THE INVENTION

Therefore, an object of the invention is to provide a golf ball having further improved flying performance.

Searching for an optimum additive for a rubber composition containing a base rubber, typically polybutadiene and an unsaturated carboxylic acid metal salt as a co-crosslinking agent, the inventors have found that when an organic sulfur compound and/or a metal-containing organic sulfur compound is added to the rubber composition, there is obtained a rubber composition which can be vulcanized into a rubbery elastomer having improved rebound resilience. If a one-piece golf ball or a multi-layered golf ball core is formed from this rubber composition, the resulting solid golf ball exhibits an increased initial velocity upon hitting and improved flying performance. The present invention is predicated on this finding.

According to the present invention, there is provided a solid golf ball comprising a rubber composition containing a base rubber, an unsaturated carboxylic acid metal salt, and a sulfur compound selected from the group consisting of an organic sulfur compound and a metal-containing organic sulfur compound.

In one form, the ball is a one-piece golf ball which is entirely formed of the present rubber composition.

In another form, the ball is a multi-layered golf ball comprising a core and a cover enclosing the core, wherein the core is formed of the present rubber composition. The core may be enclosed in the cover directly or through an intermediate layer.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross section of a one-piece golf ball.

FIG. 2 is a cross section of a two-piece golf ball.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 shows in cross section a one-piece golf ball 11. FIG. 2 shows a two-piece golf ball 21 comprising a core 23 coated with a cover 25. A plurality of, usually 200 to 600, dimples are formed on the surface of the golf balls, although they are not shown in FIGS. 1 and 2.

The solid golf ball of the present invention is a one-piece golf ball or a multi-layered golf ball in which the one-piece golf ball or the core of the multi-layered golf ball is formed from a rubber composition comprising a base rubber, an unsaturated carboxylic acid metal salt, and an organic sulfur compound and/or a metal-containing organic sulfur compound.

The base rubber used herein may be any desired rubber which is commonly used in conventional one-piece golf balls and cores of multi-layered golf balls. Polybutadiene rubbers, especially poly(1,4-butadiene) rubbers containing at least 40 mol%, preferably 80 to 100 mol% of cis-1,4 bond are preferred because of high rebound resilience, extrusion moldability, and high strength after vulcanization. If desired, the poly(1,4-butadiene) rubbers may be blended with natural rubber, polyisoprene rubber, styrene-butadiene rubber or the like. It is desired that at least 80% by weight of poly(1,4-butadiene) rubber be present in the base rubber because base rubbers containing less amounts of poly(1,4-butadiene) rubber often fail to take advantage of the rebound resilience of polybutadiene rubber.

The metal salt of unsaturated carboxylic acid is blended as a co-crosslinking agent. Examples include zinc and magnesium salts of unsaturated fatty acids having 3 to 8 carbon atoms, such as acrylic acid, methacrylic acid, maleic acid, and fumaric acid, with the zinc salts of acrylic and

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methacrylic acid being most preferred. The unsaturated carboxylic acid metal salt may be blended in a rubber either as a preformed metal salt or by introducing an α,β -unsaturated carboxylic acid and a metal oxide or hydroxide into the rubber composition and allowing them to react in the rubber composition to form a metal salt. The unsaturated carboxylic acid metal salt may be blended in any desired amount, but preferably in amounts of about 25 to about 40 parts by weight per 100 parts by weight of the base rubber.

The rubber composition used in the manufacture of the solid golf ball of the invention contains an organic sulfur compound and/or a metal-containing organic sulfur compound in addition to the base rubber and the unsaturated carboxylic acid metal salt. Examples of the organic sulfur compound include thiophenols such as pentachlorothiophenol, 4-t-butyl-o-thiocresol, 4-t-butyl-p-thiocresol, and 2-benzamidothiophenol, thiocarboxylic acids such as thio-benzoic acid, and sulfides such as dixylyl disulfide, di(o-benzamidophenyl) disulfide and alkylated phenol sulfides. Examples of the metal-containing organic sulfur compound include zinc salts of the above-mentioned thiophenols and thiocarboxylic acids. The sulfur compounds may be used alone or in admixture of two or more of them. The sulfur compound is preferably blended in amounts of from about 0.05 to about 2 parts by weight, more preferably from about 0.1 to about 0.5 parts by weight per 100 parts by weight of the base rubber.

The rubber composition of the invention may further contain a co-crosslinking initiator. Preferred examples of the co-crosslinking initiator include organic peroxides, such as dicumyl peroxide, t-butylperoxybenzoate, di-t-butylperoxide, 1,1-bis(t-butylperoxy)-3,3,5-trimethyl-cyclohexane, n-butyl-4,4-bis(t-butylperoxy)valerate, 2,2-bis(t-butylperoxy-isopropyl)benzene, and 2,5-dimethyl-2,5-di(t-butylperoxy)hexene, with the dicumyl peroxide being

-5-

most preferred. The initiator may be blended in amounts of about 0.5 to about 3 parts by weight, preferably about 1 to about 2.5 parts by weight per 100 parts by weight of the base rubber.

5 Also employable is a filler. Preferred examples of the filler include metal oxides such as zinc oxide and magnesium oxide. It may be blended in amounts of about 10 to about 80 parts by weight per 100 parts by weight of the base rubber. If desired, the rubber composition can additionally contain
10 a plasticizer, an antioxidant, and any other additives which are generally employed in the preparation of one-piece balls or cores of multi-layered balls. Their amounts may be determined without undue experimentation.

The solid golf ball of the invention may be prepared by
15 molding the above-formulated rubber composition as formulated above into a desired spherical shape, that is, a ball in the case of a one-piece ball or into a core in the case of a multi-layered ball and vulcanizing the rubber by heating. The manufacture may be in accord with conventional
20 method and conditions.

When multi-layered golf balls such as two-piece balls are manufactured, the core is coated with a cover. The cover material used herein may be selected from commonly
25 used cover materials, for example, ionomers such as Surlyn®, polyesters, and nylons. The cover usually has a thickness of 0.5 to 2.5 mm.

The core may be enclosed in the cover directly or through an intermediate layer.

The present invention may be applied to any type of
30 golf ball including small balls having a diameter of at least 41.15 mm and a weight of up to 45.92 g, and large balls having a diameter of at least 42.67 mm and a weight of up to 45.92 g.

The distribution and total number of dimples are not
35 critical although 300 to 550 dimples, preferably 350 to 540 dimples are generally formed on a ball. Preferred dimple

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-6-

arrangements are regular icosahedral, regular dodecahedral, and regular octahedral arrangements. The dimples is preferably distributed uniformly on the ball surface in such an arrangement.

5 The solid golf balls of the invention are of the above-mentioned construction and exhibit excellent flying performance.

EXAMPLE

10 Examples of the invention are given below together with comparative examples by way of illustration and not by way of limitation.

Examples 1-6

15 Solid cores for two-piece golf balls were prepared and compared with conventional two-piece golf ball cores.

Six rubber compositions were prepared by mixing the ingredients shown in Table 1. A two-piece golf ball-forming solid core having a diameter of 38.0 mm was prepared by
20 molding each of the compositions in a mold followed by vulcanization at 155°C for 20 minutes. The cores were examined by a hitting test according to the USGA standard. Using a hitting machine of the flywheel type, the cores were hit at a head speed of 38 m/sec. to measure the initial
25 velocity (in m/sec.). The results are shown in Table 1.

-7-

Table 1

	Core No.	1	2	3	4*	5*	6*
	<u>Ingredients (pbw)</u>						
	Poly(cis-1,4-butadiene)	100	90	80	100	90	80
5	Poly(cis-isoprene)	0	10	20	0	10	20
	Zinc acrylate	32	32	32	32	32	32
	Zinc oxide	21	21	21	21	21	21
	Antioxidant	0.2	0.2	0.2	0.2	0.2	0.2
	Dicumyl peroxide	1.5	1.5	1.5	1.5	1.5	1.5
10	Pentachlorothiophenol						
	zinc salt	0.2	0.2	0.2	0	0	0

Initial velocity,

m/sec. 73.32 73.11 72.80 72.95 72.67 72.30

15 * outside the scope of the invention

As seen from Table 1, the performance, that is, initial velocity upon hitting of the core is improved by blending zinc salt of pentachlorothiophenol which is a metal salt of an organic sulfur compound in a rubber composition.

Examples 7 and 8

Two rubber compositions were prepared by blending the ingredients shown in Table 2. Two-piece golf ball solid cores having a diameter of 38 mm were prepared by molding the composition in a mold and vulcanizing at 155°C for 20 minutes. An ionomer resin composition was applied to the cores to form a cover thereon. There were obtained two-piece golf balls having a diameter of 42.7 mm.

The balls were measured for weight, hardness and initial velocity. The hardness of the balls was measured as a deflection (in mm) under a load of 100 kg. The initial velocity (in m/sec.) of the balls was measured by a hitting test according to the USGA standard in which the balls were hit at a head speed of 38 m/sec. using a hitting machine of the flywheel type. The results are shown in Table 2.

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Table 2

Example 7 8*

Core composition (pbw)

	Poly(cis-1,4-butadiene) rubber	100	100
5	zinc acrylate	32	32
	zinc oxide	21	21
	Antioxidant	0.2	0.2
	Dicumyl peroxide	1.5	1.5
	Pentachlorothiophenol zinc salt	0.2	-
10	<u>Ball properties</u>		
	Weight, g	45.3	45.3
	Hardness	2.30	2.32
	Initial velocity, m/sec.	73.37	72.84

* outside the scope of the invention

15

As seen from Table 1, the golf balls of the invention are improved in initial velocity upon hitting and hence, in flying performance.

20 Although some preferred embodiments have been described, many modifications and variations may be made thereto in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise

25 than as specifically described.

Can we claim:

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CLAIMS:

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~~1. A solid golf ball comprising a rubber composition containing a base rubber, an unsaturated carboxylic acid metal salt, and a sulfur compound selected from the group consisting of an organic sulfur compound and a metal-containing organic sulfur compound.~~

2. The golf ball of claim 1 wherein said rubber composition contains
100 parts by weight of the base rubber,
about 25 to about 40 parts by weight of the unsaturated carboxylic acid metal salt, and
about 0.05 to about 2 parts by weight of the sulfur compound.

3. The solid golf ball of claim 1 which is a one-piece golf ball, the ball being formed of said rubber composition.

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4. The solid golf ball of claim 1 which is a multi-layered golf ball comprising a core and a cover enclosing the core, said core being formed of said rubber composition.

5. The solid golf ball of claim 4 which is a two-piece ball wherein the core is directly enclosed in the cover.

6. The solid golf ball of claim 4 which further includes an intermediate layer disposed between the core and the cover.

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ABSTRACT OF THE DISCLOSURE

One-piece and multi-layered golf balls are improved in flying performance by forming the one-piece ball entirely or multi-layered golf ball core from a rubber composition comprising a base rubber, an unsaturated carboxylic acid metal salt, and an organic sulfur compound and/or a metal salt thereof.

EA

SOLE/JOINT

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name: that I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural names are listed below) of the subject matter claimed and for which a patent is sought in the application entitled:

which application is: SOLID GOLF BALL

☒ the attached application
(for original application)

☐ application Serial No. _____
filed _____, and amended on _____

(for declaration not accompanying application)

that I have reviewed and understand the contents of the specification of the above-identified application, including the claims, as amended by any amendment referred to above: that I acknowledge my duty to disclose information of which I am aware which is material to the examination of this application under 37 C.F.R. 1.56(a), i.e. such information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent: that I hereby claim foreign priority benefits under Title 35, United States Code §119, §172 or §365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified on said list any foreign application for patent or inventor's certificate on this invention having a filing date before that of the application on which priority is claimed:

Application Number	Country	Filing Date	Priority Claimed (yes or no)
1-118460	Japan	5/11/1989	Yes

I hereby claim the benefit of Title 35, United States Code §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in a listed prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge my duty to disclose any material information under 37 C.F.R. 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	Filing Date	Status (patented, pending, abandoned)

I hereby appoint John H. Mion, Reg. No. 18,879, Donald E. Zinn, Reg. No. 19,046, Thomas J. Macpeak, Reg. No. 19,292, Robert J. Seas, Jr., Reg. No. 21,092, David Mexic, Reg. No. 23,063, Robert V. Sloan, Reg. No. 22,775, Peter D. Olexy, Reg. No. 24,513, I. Frank Osha, Reg. No. 24,625, Waddell A. Biggart, Reg. No. 24,861, Robert G. McMorrow, Reg. No. 19,093, Louis Gubinsky, Reg. No. 24,835, Neil B. Siegel, Reg. No. 25,200, David J. Cushing, Reg. No. 28,703, John R. Inge, Reg. No. 26,916, Joseph J. Ruch, Jr., Reg. No. 26,577, Sheldon I. Landsman, Reg. No. 25,430, Richard C. Turner, Reg. No. 29,710, Howard L. Bernstein, Reg. No. 25,665, and Alan J. Kasper, Reg. No. 25,426, my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and request that all correspondence about the application be addressed to SUGIYAMA, MION, ZINN, MACPEAK & SEAS, 8002 Pennsylvania Avenue, N.W., Washington, D.C. 20037.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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Print Of Drawing
As Original Filed

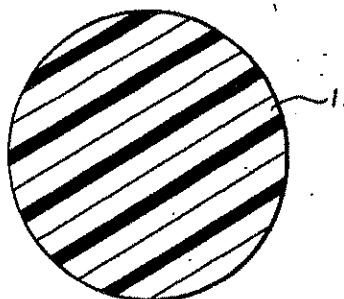
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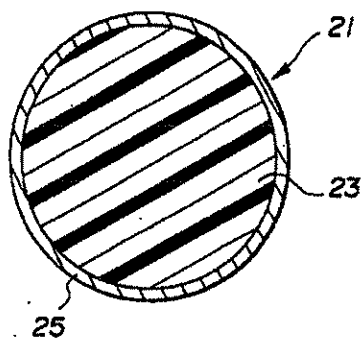
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FIG. 1



DATE	O.G. FIG. 1	
	CLASS	SUBCLASS
BY	521	772
DRAFTSMAN		

FIG. 2





特許庁
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075216182-23105

5-10-90

1001

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6-14-96

Priority

Paper

#2

付の書類は下記の出願書類の謄本に相違ないことを証明する。
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年月日
Application: 1989年5月11日

番号
on Number: 平成1年特許願第118460号

人
(s): 株式会社ブリヂストン

1990年3月16日

特許庁長官
Commissioner,
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出証平 2-10198

(14,000円)

特 許 願 書

平成1年5月11日

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1. 発明の名称

ソリッドゴルフボール

2. 請求項の数 1

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6. 添付書類の目録

- | | |
|-----------|----|
| ① 明 細 書 | 1通 |
| ② 願 書 副 本 | 1通 |
| ③ 委 任 状 | 1通 |

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明 細 書

1. 発明の名称

ソリッドゴルフボール

2. 特許請求の範囲

1. ワンピースゴルフボール又はカバー材で直接もしくは中間層を介して被覆した多層構造ゴルフボールの芯球を、基材ゴムと、不飽和カルボン酸の金属塩と、有機硫黄化合物及び／又は金属含有有機硫黄化合物とを含有するゴム組成物で形成したことを特徴とするソリッドゴルフボール。

3. 発明の詳細な説明

産業上の利用分野

本発明は、飛び性能に優れたソリッドゴルフボールに関する。

従来技術及び発明が解決しようとする課題

ソリッドゴルフボールには、完全一体成形のワンピースゴルフボールと芯球をカバーで被覆したツーピースゴルフボールと、更には芯球とカバー層との間に1層又は2層以上の中間層を有する多

層構造ゴルフボールとがある。

これらのソリッドゴルフボールは、ゴム組成物を加硫成型して得られる弾性部分をその一部（多層構造ボールの芯球）又は全部（ワンピースゴルフボール）に有している。従来、このような弾性部分を形成するためのゴム組成物中には、ポリブタジエンゴム等の基材ゴムと共にボールの反発係数及び耐衝撃性を向上させるために、 α 、 β -エチレン系不飽和カルボン酸の金属塩等の不飽和結合を有するモノマーを共架橋剤として配合することが知られている。この共架橋剤は過酸化物等の共架橋開始剤の作用によって例えばポリブタジエンゴム主鎖にグラフト又は架橋し、ポリブタジエンと該モノマーとによる三次元架橋重合体を形成し、ワンピースゴルフボール又は多層構造ゴルフボールの芯球に適度な硬さと耐久性を付与するものであり、このような共架橋剤を配合したゴム組成物で形成したワンピースゴルフボール又は芯球をカバーで被覆した多層構造ソリッドゴルフボールは良好な飛び性能及び耐久性を示すことが知ら

れている。

しかしながら、ゴルフプレーヤーのゴルフボールの飛び性能に対する要求は非常に強く、従って飛び性能の更なる向上が望まれている。

本発明は、上記事情に鑑みなされたもので、更に飛び性能の向上したソリッドゴルフボールを提供することを目的とする。

課題を解決するための手段及び作用

本発明者は、上記目的を達成するため鋭意検討を行なった結果、ポリブタジエンゴム等の基材ゴムに共架橋剤として不飽和カルボン酸の金属塩を配合したゴム組成物に対し、有機硫黄化合物及び／又は金属含有有機硫黄化合物を添加することにより、これを加硫して得られるゴム弾性体の反撥弾性が向上すること、またこのゴム組成物を用いてワンピースゴルフボール又は多層構造ソリッドゴルフボールの芯球を形成することにより、ボール打撃時の初速度が向上し、優れた飛び性能を示すソリッドゴルフボールが得られることを見出し、本発明を完成したものである。

従って、本発明は、ワンピースゴルフボール又はカバー材で直接もしくは中間層を介して被覆した多層構造ゴルフボールの芯球を、基材ゴムと、不飽和カルボン酸の金属塩と、有機硫黄化合物及び／又は金属含有有機硫黄化合物とを含有するゴム組成物で形成したことを特徴とするソリッドゴルフボールを提供する。

以下、本発明につき更に詳しく説明する。

本発明のソリッドゴルフボールは、上述したように、基材ゴムと不飽和カルボン酸の金属塩と有機硫黄化合物及び／又は金属含有有機硫黄化合物とを含有するゴム組成物でワンピースゴルフボール又は多層構造ソリッドゴルフボールの芯球を形成したものである。

ここで、上記基材ゴムとしては、通常のワンピースゴルフボール又は多層構造ソリッドゴルフボールの芯球材料として使用されるものを用いることができ、特に制限されないが、シス構造を少なくとも40%以上有する1,4-ポリブタジエンゴムが高反撥弾性、押出加工性、加硫物の高強度

化等の点から特に好ましく使用される。この場合、このような1, 4-ポリブタジエンゴムに天然ゴム、ポリイソプレンゴム、スチレンブタジエンゴムなどを所望により適宜配合することができる。なお、1, 4-ポリブタジエンゴムは基材ゴム成分中に80重量%以上含有するようにすることが好ましく、これが80重量%未満であるとポリブタジエンゴムが持つ優れた反発弾性が損なわれる場合がある。

また、上記不飽和カルボン酸の金属塩は共架橋剤として配合されるもので、その具体例としては、アクリル酸、メタクリル酸、マレイン酸、フマル酸等の炭素原子数3~8の不飽和脂肪酸の亜鉛塩やマグネシウム塩などが例示されるが、特にアクリル酸又はメタクリル酸の亜鉛塩が好適に使用される。これら不飽和カルボン酸の金属塩は、予め金属塩の形に調製したものを配合してもよいが、ゴム組成物中で α , β -不飽和カルボン酸と金属酸化物又は金属水酸化物等とを反応させて金属塩とすることもできる。なお、この不飽和カルボン

酸の金属塩の配合量は特に限定されないが、上記基材ゴム100重量部に対して25～40重量部とすることが好ましい。

本発明ソリッドゴルフボールの製造に用いられるゴム組成物は上記基材ゴム、共架橋剤に加えて有機硫黄化合物及び／又は金属含有有機硫黄化合物を配合したものである。ここで、有機硫黄化合物としては、ペンタクロロチオフェノール、4-tert-ブチル-2-チオフェノール、4-tert-ブチルチオフェノール、2-ベンズアミドチオフェノール等のチオフェノール類、チオ安息香酸等のチオカルボン酸類、ジキシリルジスルフィド、ジ(2-ベンズアミドフェニル)ジスルフィド、アルキル化フェノールスルフィド等のスルフィド類などが好適に用いられ、また金属含有有機硫黄化合物としては、上記チオフェノール類、チオカルボン酸類の亜鉛塩などが好ましく使用される。これらは1種を単独で使用しても、2種以上を組み合わせで使用してもよい。なお、これら化合物の配合量は、上記基材ゴム100重量部に対して

0.05～2重量部、特に0.1～0.5重量部とすることが好ましい。

上記ゴム組成物には、共架橋開始剤を配合することができる。この場合、共架橋開始剤としては、過酸化物系のもの、例えばジクミルパーオキシドやｔ-ブチルパーオキシベンゾエート、ジ-ｔ-ブチルパーオキシド、1,1-ビス(ｔ-ブチルパーオキシ)3,3,5-トリメチルシクロヘキサン等の有機過酸化物が好適に使用されるが、中でもジクミルパーオキシドが特に好ましく用いられる。この共架橋開始剤の配合量は、基材ゴム100重量部に対して0.5～3重量部、特に1～2.5重量部とすることが好ましい。更に、このゴム組成物中には、酸化亜鉛、可塑化剤、老化防止剤その他ワンピースゴルフボールや多層構造ソリッドゴルフボールの芯球の製造に通常使用し得る成分を必要により適宜配合することができる。

本発明のソリッドゴルフボールは、上記ゴム組成物を加熱等により加硫し、成型して、ワンピースゴルフボール又は多層構造ソリッドゴルフボー

ルの芯球を製造するものであるが、この場合、その製造法、条件等は通常の方法、条件とすることができる。

なお、ツーピースボール等の多層構造ソリッドゴルフボールとする場合は、上記ゴム組成物で形成した芯球にカバーを被覆するが、この場合カバー材料としては、アイオノマー、サーリン、ポリエステル、ナイロン等の通常のカバー材料を好適に使用し得る。

発明の効果

本発明のソリッドゴルフボールは、上述した構成としたことにより、飛び性能の更なる向上を達成することができる。

以下、実施例及び比較例を示し、本発明を具体的に説明するが、本発明は下記の実施例に制限されるものではない。なお、実施例、比較例に先立ち、本発明ソリッドゴルフボールを構成するツーピースゴルフボール用ソリッドコア（芯球）を製造し、その性能を従来のツーピースゴルフボール用コアと比較した実験例を示す。

〔実験例〕

第1表に示す配合成分を混合して6種のゴム組成物を調製した。これを金型を用い、155℃で20分間加硫して直径38.0mmのツーピースゴルフボール用ソリッドコアを製造した。次に、これらをUSGA方式に従い、フライホイール式の打撃試験機を用い、ヘッドスピード38m/secで打撃したときの初速度を測定した。結果を第1表に示す。

第 1 表

成 分 (重量部)	コ ア					
	1	2	3	4	5	6
ゴ	100	90	80	100	90	80
ム	0	10	20	0	10	20
アクリル酸亜鉛	32	32	32	32	32	32
酸化亜鉛	21	21	21	32	32	32
老化防止剤	0.2	0.2	0.2	0.2	0.2	0.2
ジクミルパーオキサイド	1.5	1.5	1.5	1.5	1.5	1.5
ペンタクロロチオフェノールの亜鉛塩	0.2	0.2	0.2	0	0	0
コアの初速度 (m/s)	73.32	73.11	72.80	72.95	72.67	72.30
	本発明コア			比較コア		

第1表に示した結果より、ゴム組成物中に有機硫黄化合物の金属塩であるペンタクロロチオフェノールの亜鉛塩を配合することにより、コア性能(打撃初速度)が向上することが確認された。

〔実施例、比較例〕

第2表に示す配合成分を混合して2種類のゴム組成物を調製し、これを金型を用い、155℃で20分間加硫して直径38mmのツーピースゴルフボール用ソリッドコアを2種類製造した。次いで、これらのコアにアイオノマー樹脂を被覆形成して直径42.7mmのツーピースゴルフボールを製造した。

これらのゴルフボールをUSGA方式に従い、フライホイール式の打撃試験機を用い、ヘッドスピード38m/secで打撃したときの初速度を測定した。結果を第2表に示す。

第 2 表

成 分 (重量部)		実施例	比較例
シス1,4-ポリブタジエンゴム		100	100
アクリル酸亜鉛		32	32
酸化亜鉛		21	21
老化防止剤		0.2	0.2
ジクミルパーオキシサイド		1.5	1.5
ペンタクロロチオフェノールの亜鉛塩		0.2	—
ツーピース ゴルフボール の物性	重 量 (g)	45.3	45.3
	ボール硬度 *	2.30	2.32
	ボール初速度 (m/s)	73.37	72.84

* 100 kg 荷重をかけた時のたわみ量

第2表の結果より、本発明のゴルフボールはボール初速度が高く、飛び性能が向上したものであることが確認された。

出願人 株式会社ブリヂストン

代理人 弁理士 小 島 隆 司 (他1名)


**UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office**

 Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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07/521,618 05/10/90 EGASHIRA

Y 023105

EXAMINER

LIEBERMAN, A

 SUGHRUE, MION, ZINN, MACPEAK & SEAS
2100 PENNSYLVANIA AVE., N. W.
WASHINGTON, DC 20037

ART UNIT PAPER NUMBER

151

43

DATE MAILED:

12/12/90

 This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

☒ This application has been examined ☐ Responsive to communication filed on _____ ☐ This action is made final.

 A shortened statutory period for response to this action is set to expire 3 month(s), _____ days from the date of this letter.
Failure to respond within the period for response will cause the application to become abandoned, 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

- | | |
|---|---|
| 1. <input checked="" type="checkbox"/> Notice of References Cited by Examiner, PTO-892. | 2. <input type="checkbox"/> Notice re Patent Drawing, PTO-848. |
| 3. <input type="checkbox"/> Notice of Art Cited by Applicant, PTO-1449. | 4. <input type="checkbox"/> Notice of Informal Patent Application, Form PTO-152 |
| 5. <input type="checkbox"/> Information on How to Effect Drawing Changes, PTO-1474. | 6. <input type="checkbox"/> _____ |

Part II SUMMARY OF ACTION

1. ☒ Claims 1-6 are pending in the application.
Of the above, claims _____ are withdrawn from consideration.
2. ☐ Claims _____ have been cancelled.
3. ☐ Claims _____ are allowed.
4. ☒ Claims 1-6 are rejected.
5. ☐ Claims _____ are objected to.
6. ☐ Claims _____ are subject to restriction or election requirement.
7. ☐ This application has been filed with Informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.
8. ☐ Formal drawings are required in response to this Office action.
9. ☐ The corrected or substitute drawings have been received on _____. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable; ☐ not acceptable (see explanation or Notice re Patent Drawing, PTO-848).
10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on _____, has (have) been ☐ approved by the examiner; ☐ disapproved by the examiner (see explanation).
11. ☐ The proposed drawing correction, filed _____, has been ☐ approved; ☐ disapproved (see explanation).
12. ☒ Acknowledgement is made of the claim for priority under U.S.C. 119. The certified copy has ☒ been received ☐ not been received
☐ been filed in parent application, serial no. _____; filed on _____.
13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 463 O.G. 219.
14. ☐ Other

EXAMINER'S ACTION

Serial No. 521,618

-2-

Art Unit 151

15. Claims 1-6 are rejected under 35 U.S.C. 112, first and second paragraphs, as the claimed invention is not described in such full, clear, concise and exact terms as to enable any person skilled in the art to make and use the same, and/or for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 and 3-6 are indefinite in their failure to recite the proportions of the ingredients of the solid golf ball in accordance with the written description of the invention. Note, for example, lines 8 and 9, page 4; lines 24-26, page 4; and lines 1 and 2, page 5 of the specification. It seems evident that said written description of the invention is inadequate to support claims which are not limited in the manner discussed above.

Claims 1-6 should be limited to the type of diene rubber disclosed as suitable in the specification, as in lines 18-31, page 3. It is seen that the performance in the claimed solid golf ball made with the recited ingredients could not be predicted if the rubber used in the golf ball composition were, for example, a polyurethane elastomer.

Serial No. 521,618

-3-

Art Unit 151

Claims 1-6 should be limited to the sulfur compound which is disclosed as providing a measurable difference in the golf balls made from the composition containing it. It seems evident that disclosure of the zinc salt of pentachlorothiophenol does not provide sufficient basis in the written description of the invention for claims which read on any sulfur compound.

Claims 1-6 fail to point out the invention with the particularity required by 35 U.S.C. 112, as no golf ball composition which does not contain a co-cross-linking initiator is shown to be useful. It is therefore seen that the written description of the invention is inadequate to support a claim which does not require the presence of such an ingredient.

16. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

"A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Serial No. 521,618

-4-

Art Unit 151

Subject matter developed by another person, which qualifies as prior art only under subsection (f) and (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Claims 1 and 3-6 are rejected under 35 U.S.C. 103 as being unpatentable over Isaac.

In view of the fact that claims 1 and 3-6 require the presence of a negligible amount of sulfur compound because of their failure to recite the quantities of ingredients present, claims 1 and 3-6 are unpatentable over Isaac. Isaac is representative of the prior art solid golf ball prepared from a composition comprising a diene rubber, a metal salt of an unsaturated carboxylic acid and a free radical initiator. In view of the prior art teachings as represented by Isaac, one of ordinary skill in the art would have been motivated to prepare a solid golf ball which is not patentably distinct from the golf ball of claims 1 and 3-6.

17. The remaining cited references serve to further show the state of the art.

A. Lieberman:cde
(703) 308-2351
12-6-90

Alan Lieberman
ALLAN M. LIEBERMAN
PATENT EXAMINER
GROUP 150 - ART UNIT 151

TO SEPARATE, HOLD TOP AND BOTTOM EDGES, SNAP-APART AND DISCARD CARBON

FORM PTO-892 (REV. 3-78)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		SERIAL NO. 524618	GROUP ART UNIT 1511	ATTACHMENT TO PAPER NUMBER 3		
NOTICE OF REFERENCES CITED				APPLICANT(S) Egashira et al				
U.S. PATENT DOCUMENTS								
	DOCUMENT NO.	DATE	NAME	CLASS	SUB-CLASS	FILING DATE IF APPROPRIATE		
A	3804421	1/74	Alex et al	293	218			
B	4096258	2/78	Moore et al	273	218			
C	4398000	8/83	Kanaka et al	023	206			
D	4770422	9/88	Isaac	024	908			
E								
F								
G								
H								
I								
J								
K								
FOREIGN PATENT DOCUMENTS								
	DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUB-CLASS	PERTINENT SHTS. DWG	PP. SPEC.
L								
M								
N								
O								
P								
Q								
OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)								
R								
S								
T								
U								
EXAMINER A. Rieberman				DATE 12/1/90				
* A copy of this reference is not being furnished with this office action. (See Manual of Patent Examining Procedure, section 707.05 (a).)								



151

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE RECEIVED: GROUP 150

1991 APR 19 PM 3:55

Re application of

Yoshinori EGASHIRA et al

Group Art Unit: 151

Filed: May 10, 1990

Examiner: Lieberman, A.

For:

PETITION FOR EXTENSION OF TIME UNDER 37 CFR
\$1.136 AND AUTHORIZATION FOR PAYMENT OF FEE
UNDER 37 CFR \$1.17

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

Pursuant to 37 CFR \$1.136, Applicant hereby petitions for an extension of time of one month, extending the time for responding to the Office Action of December 12, 1990, to April 12, 1991.

Please charge \$100.00 to Deposit Account No. 19-4880 for the extension of time fee or any other fees necessary for the continued pendency of this application. A duplicate copy of this sheet is enclosed. Please charge any additional fees or credit any overpayment to Deposit Account No. 19-4880.

Respectfully submitted,

Mark Boland

Mark Boland
Registration No. 32,197

SUGHRUE, MION, ZINN,
MACPEAK & SEAS
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3202
(202) 293-7060

Date: April 12, 1991

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of
Yoshinori EGASHIRA et al

~~33~~ ~~MAILED~~ 07/521/618

Filed: May 10, 1990

~~33~~ ~~MAILED~~ 07/521/618



Group ~~MAILED~~ Unit 151
Examiner: Lieberman, A.

SUBMISSION OF DECLARATION

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

Submitted herewith is an executed Declaration of Yoshinori
Egashira.

Respectfully submitted,

Mark Boland
Mark Boland
Registration No. 32,197

SUGHRUE, MION, ZINN,
MACPEAK & SEAS
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3202
(202) 293-7060

Date: April 12, 1991

IN THE U.S. PATENT AND TRADEMARK OFFICE

RECEIVED: GROUP 150
1991 APR 19 PM 3:55

APPLICANT: Yoshinori EGASHIRA et al
SERIAL No.: 07/521,618
FILED: May 10, 1990
FOR: SOLID GOLF BALL
GROUP: 151
EXAMINER: LIEBERMAN, A



DECLARATION

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir,

I, Yoshinori EGASHIRA, a citizen of Japan
and a resident of No. 6-6, Musashidai 7-chome,
Hidaka-machi, Iruma-gun, Saitame-ken, Japan
do hereby declare that:

1. I was graduated from Kurume College
of Technology in March, 1975. Since April,
1975, I have conducted in Bridgestone
Corporation, the assignee of the above -
identified application, research and development
in the field of golf balls.

2. I am one of the named inventors of the above - identified patent application and hence, am familiar with the subject matter disclosed in said application.

3. In order to show the effect of the present invention on a two - piece solid golf ball, I conducted the following experiments.
[Experiment]

Rubber compositions were prepared by blending the ingredients shown in Table 1. Two - piece golf ball solid cores having a diameter of 38 mm were prepared by molding the composition in a mold and vulcanizing at 155°C for 20 minutes. An inonomer resin composition was applied to the cores to form a cover thereon. There were obtained two - piece golf balls having a diameter of 42.7 mm.

The balls were measured for weight, hardness and initial velocity. The hardness of the balls was measured as a deflection (in mm) under a load of 100 kg. The initial velocity (in m/sec.) of the balls was measured by a hitting test according to the USGA standard in which the balls were hit at a head speed of 38 m/sec. using a hitting machine of the flywheel

type. The results are shown in Table 1.

As recognized from the results of Table 1, various organic sulfur compounds including thiophenols, thiocarboxylic acids and sulfides can give improved initial velocity.

Table 1

	No. 1	No. 2	No. 3	No. 4
Core composition (pbw)				
Poly(cis-1,4-butadiene) rubber	100	100	100	100
Zinc acrylate	32	32	32	32
Zinc Oxide	21	21	21	21
Antioxidant	0.2	0.2	0.2	0.2
Dicumyl peroxide	1.5	1.5	1.5	1.5
Pentachlorothiophenol zinc salt	0.2	—	—	—
2-benzamidothiophenol	—	0.2	—	—
Thiobenzoic acid	—	—	0.2	—
Pentachlorothiophenol	—	—	—	0.2
Ball properties				
Weight, g	45.3	45.3	45.3	45.3
Hardness	2.30	2.38	2.40	2.28
Initial velocity, m/sec.	73.37	73.10	73.05	73.32

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated this 25th day of March, 1991

Yoshinori Egashira

Yoshinori EGASHIRA

RECEIVED: GROUP 150

1991 APR 19 PM 3:55

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE



re application of

Yoshinori EGASHIRA et al

Group Art Unit: 151

Examiner: Lieberman, A.

Filed: May 10, 1990

For: ~~GROUP 150~~

AMENDMENT

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

This Amendment is in response to the Office Action dated December 12, 1990 in the above-identified application and is accompanied by a Petition for a One-Month Extension of Time.

Please amend the application as follows:

IN THE CLAIMS:

1. (Amended) A solid golf ball comprising a rubber composition containing 100 parts by weight of a base rubber selected from the group consisting of polybutadiene rubber, natural rubber, polyisoprene rubber and styrene-butadiene rubber, about 25 to about 40 parts by weight of an unsaturated carboxylic acid metal salt, [and] about 0.05 to about 2 parts by weight of a sulfur compound selected from the group consisting of an organic sulfur

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compound and a metal-containing organic sulfur compound, and about 0.5 to about 3 parts by weight of an organic peroxide.

Cancel claim 2, the subject matter thereof having been incorporated into claim 1.

Please add the following claims:

- a Claim ⁶7. The ^{solid} golf ball of claim 1, wherein said base rubber is a polybutadiene rubber.
- ² Claim ⁸8. The ^{solid} golf ball of claim ⁶7, wherein said polybutadiene rubber is a poly(1,4-butadiene) rubber containing at least 40 mol% of cis-1,4 bond.
- e Claim ⁹9. The ^{solid} golf ball of claim ⁸8, wherein said poly(1,4-butadiene) rubber contains at least 80 to 100 mol% of cis-1,4 bond.
- e Claim ¹⁰10. The ^{solid} golf ball of claim ⁹9, wherein said base rubber comprises at least 80% by weight of said poly(1,4-butadiene) rubber.
- e Claim ¹¹11. The ^{solid} golf ball of claim ¹⁰10, wherein said poly(1,4-butadiene) rubber is blended with a natural rubber, a polyisoprene rubber or a styrene-butadiene rubber.

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c
A 2
Cont'd
Claim 12. The ^{solid}golf ball of claim 1, wherein said unsaturated carboxylic acid metal salt is a zinc or magnesium salt of an unsaturated fatty acid having 3 to 8 carbon atoms.

Claim 13. The golf ball of claim 1, wherein said organic sulfur compound is selected from the group consisting of thiophenols, thiocarboxylic acids, and sulfides.

c
B
Claim 14. The ^{solid}golf ball of claim 13, wherein said thiophenol is selected from the group consisting of pentachlorothiophenol, 4-t-butyl-o-thiocresol, 4-t-butyl-p-thiocresol, and 2-benzamidothiophenol.

c
B
Claim 15. The ^{solid}golf ball of claim 13, wherein said thiocarboxylic acid is thiobenzoic acid.

Claim 16. The solid golf ball of claim 13, wherein said sulfide is selected from the group consisting of dioxyl sulfide, di(o-benzamidophenyl) disulfide and alkylated phenol sulfides.

Sub
B 2
Claim 17. The golf ball of claim 13, wherein said metal-containing organic sulfur compound is selected from

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zinc salts of said thiophenols and thiocarboxylic acids.

Sub B2 cont
A3 Cont'd
 Claim 11. The ^{solid} golf ball of claim 1, wherein said sulfur compound is blended in an amount of from about 0.1 to about 0.5 parts by weight.

Claim 12. The ^{solid} golf ball of claim 1, wherein said organic peroxide is selected from the group consisting of dicumyl peroxide, t-butylperoxybenzoate, di-t-butylperoxide, 1,1-bis(t-butylperoxy)-3,3,5-trimethyl-cyclohexane, n-butyl-4,4-bis(t-butylperoxy)valerate, 2,2'-bis(t-butylperoxy-isopropyl)benzene, and 2,5-dimethyl-2,5-di(t-butylperoxy)hexene.

Claim 13. The ^{solid} golf ball of claim 1, wherein said rubber composition further comprises a filler.

REMARKS

Review and reconsideration on the merits are respectfully requested.

Claim 1 has been amended as shown. Support for the Markush group of base rubbers is found on page 3 of the specification,

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lines 20-27. Support for the 100 parts by weight of the base rubber is found on page 4 of the specification lines 9-10. Support for the amount of unsaturated carboxylic acid metal salt is found on page 4 of the specification, lines 6-10. Support for the amount of sulfur compound is found on page 4 of the specification lines 24-26. Support for the amounts of base rubber, unsaturated carboxylic acid metal salt and the sulfur compound is also found in canceled claim 2. Support for the amount of organic peroxide is found on page 5 of the specification, lines 1-3. No new matter has been added.

Dependent claims 7-20 have been added which are directed to preferred aspects of the invention.

Entry of the aforementioned amendments is respectfully requested.

In paragraph 15 of the Office Action, claims 1-6 stand rejected under 35 U.S.C. §112, first and second paragraphs. The individual grounds for this rejection are set forth separately below:

- (1) The Examiner states that claims 1 and 3-6 are indefinite in their failure to recite the proportions of the ingredients of the solid golf ball in accordance with the written description of the invention.

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Claim 1 as amended recites proportions for all of the recited ingredients.

(2) The Examiner states that claims 1-6 should be limited to the type of diene rubber disclosed as suitable in the specification (page 3, lines 18-31). The Examiner further states that performance of the claimed solid golf ball made with the recited ingredients could not be predicted if the rubber used in the golf ball composition was, for example, polyurethane elastomer.

Claim 1 as amended now recites that a base rubber is selected from the group consisting of polybutadiene rubber, natural rubber, polyisoprene rubber and styrene-butadiene rubber as found on page 3, lines 18-31 of the specification.

(3) The Examiner states that claims 1-6 should be limited to the sulfur compound which is disclosed as providing a measurable difference in the golf balls made from the composition containing it. The Examiner further states that it seems evident that disclosure of the zinc salt of pentachlorothiophenol does not provide sufficient basis in the written description of the invention for claims which read on any sulfur compound.

This ground of the rejection is respectfully traversed.

An enabling disclosure appears in the specification at page 14, lines 15-23 which recites various types of sulfur compounds and specific examples thereof. Based on the disclosure as a whole, one

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of ordinary skill in the art would easily see that that various sulfur compounds disclosed in the specification would give results on a par with those in the working examples. There is no legal requirement to use each specific compound in a working example.

Furthermore, the Declaration of Mr. Yoshinori Egashira under §1.132, submitted herewith, shows that similar results are obtained when other sulfur compounds are employed in addition to pentachlorothiophenol. The Declaration demonstrates that various organic sulfur compounds including thiophenols, thiocarboxylic acids and sulfides can give improved velocity. All the examples in Table 1 of the Declaration demonstrate an improved initial velocity.

In view of the above, withdrawal of this ground of the rejection is respectfully requested.

(4) The Examiner states that claims 1-6 fail to point out the invention with particularity as no golf ball composition which does not contain a co-crosslinking initiator is shown to be useful.

Claim 1 as amended now recites the presence of a co-crosslinking initiator, i.e., an organic peroxide.

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In view of the foregoing, each of the specific grounds of the rejection under 35 U.S.C. §112 is deemed to have been overcome. Withdrawal is requested.

In paragraph 16 of the Office Action, claims 1 and 3-6 stand rejected under 35 U.S.C. §103 as being unpatentable over Isaac. For convenience, the Examiner's reasoning is set forth below.

The Examiner states that in view of the fact that claims 1 and 3-6 require the presence of a negligible amount of sulfur compound because of their failure to recite the quantities of the ingredients present, claims 1 and 3-6 are unpatentable over Isaac. The Examiner further states that Isaac is representative of the prior art solid golf ball prepared from a composition comprising a diene rubber, a metal salt of an unsaturated carboxylic acid and a free radical initiator. The Examiner concludes that in view of the prior art teachings as represented by Isaac, one of ordinary skill in the art would have been motivated to prepare a solid golf ball which is not patentably distinct from the golf ball of claims 1 and 3-6.

This rejection is traversed with respect to claim 1, as amended.

Isaac fails to disclose or suggest a sulfur compound selected from the group consisting of an organic sulfur compound and a metal-containing organic sulfur compound as recited in Applicant's

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PATENT APPLICATION

now amended claim 1, and, therefore, fails to disclose or suggest the present invention. Thus, a prima facie case of obviousness has not been set forth.

Claim 1 as amended includes the quantities of the ingredients in the golf ball of Applicant's claim 1. Therefore, in light of the fact that a rejection was not sustained over claim 2 which recites such amounts, claim 1 which now recites the required amounts, along with dependent claims 3-20, are considered to be in condition for allowance.

Accordingly, withdrawal of the outstanding rejection under §103 is respectfully requested.

Early indication of allowability is respectfully requested. Should any minor points remain prior to issuance of a Notice of Allowance, the Examiner is requested to telephone the undersigned at the below listed telephone number.

SUGHRUE, MION, ZINN,
MACPEAK & SEAS
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3202
(202) 293-7060

Respectfully submitted,

Mark Boland ✓
Mark Boland
Registration No. 32,197

Date: April 12, 1991


UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

 Address: COMMISSIONER OF PATENTS AND TRADEMARKS
 Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
07/521,618	05/10/90	EGASHIRA Y	023105

LEE, Y EXAMINER

 SUGHRUE, MION, ZINN, MACPEAK & SEAS
 2100 PENNSYLVANIA AVE., N. W.
 WASHINGTON, DC 20037

ART UNIT 139 PAPER NUMBER 7

07/08/91

DATE MAILED:

 This is a communication from the examiner in charge of your application.
 COMMISSIONER OF PATENTS AND TRADEMARKS

☐ This application has been examined ☒ Responsive to communication filed on _____ ☐ This action is made final.

 A shortened statutory period for response to this action is set to expire 3 month(s), _____ days from the date of this letter.
 Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

- | | |
|---|---|
| 1. <input checked="" type="checkbox"/> Notice of References Cited by Examiner, PTO-892. | 2. <input type="checkbox"/> Notice re Patent Drawing, PTO-848. |
| 3. <input type="checkbox"/> Notice of Art Cited by Applicant, PTO-1449. | 4. <input type="checkbox"/> Notice of Informal Patent Application, Form PTO-152 |
| 5. <input type="checkbox"/> Information on How to Effect Drawing Changes, PTO-1474. | 6. <input type="checkbox"/> _____ |

Part II SUMMARY OF ACTION

1. ☒ Claims 1 and 3-20 are pending in the application.
 Of the above, claims _____ are withdrawn from consideration.
2. ☒ Claims 2 have been cancelled.
3. ☐ Claims _____ are allowed.
4. ☒ Claims 1 and 3-20 are rejected.
5. ☐ Claims _____ are objected to.
6. ☐ Claims _____ are subject to restriction or election requirement.
7. ☐ This application has been filed with informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.
8. ☐ Formal drawings are required in response to this Office action.
9. ☐ The corrected or substitute drawings have been received on _____. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable; ☐ not acceptable (see explanation or Notice re Patent Drawing, PTO-848).
10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on _____, has (have) been ☐ approved by the examiner; ☐ disapproved by the examiner (see explanation).
11. ☐ The proposed drawing correction, filed _____, has been ☐ approved; ☐ disapproved (see explanation).
12. ☐ Acknowledgement is made of the claim for priority under U.S.C. 119. The certified copy has ☐ been received ☐ not been received ☐ been filed in parent application, serial no. _____; filed on _____.
13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
14. ☐ Other

EXAMINER'S ACTION

BEST COPY

Serial No. 390907

Art Unit 1598

Claims 1 and 3-20 are rejected under 35 U.S.C. § 103 as being unpatentable over Isaac or Kakiuchi in view of Tominaga.

Isaac (column 2, lines 41-49) or Kakiuchi (abstract and Examples 1-6) disclose a composition for golf balls comprised of polybutadiene, an unsaturated carboxylic acid metal salt and an organic peroxide. The composition of the primary references differ from the instant invention in that it lacks a sulfur compound. However, Tominaga (column 1, lines 31-50) teaches that golf balls made of a composition containing a polysulfide compound have improved rebound performance as well as hardness and durability. Thus, it would have been obvious to one of ordinary skill in the art to incorporate the polysulfide compound of Tominaga into the composition of the primary references for the purpose of making golf balls having improved rebound performance as well as hardness and durability.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --
 (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

454 Claims 1, 3-20 are rejected under 35 U.S.C. § 102(b) as being anticipated by Tominaga.

Tominaga (Table 1-3) discloses a composition for golf balls comprised of polybutadiene, an unsaturated carboxylic acid metal

Serial No. 398903

-3-

Art Unit 1598

salt, a polysulfide compound and an organic peroxide. The instant invention clearly reads on the Tominaga reference, and thus lacks novelty.

Any inquiry concerning this communication should be directed to Yong S. Lee at telephone number (703) 308-4354.


PAUL R. MICHL
SUPERVISORY PATENT EXAMINER
ART UNIT 156

YSL
Yong S. Lee
June 27, 1991

TO SEPARATE, HOLD TOP AND BOTTOM EDGES, SNAP-APART AND DISCARD CARBON

FORM PTO-892 (REV. 3-78)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		SERIAL NO. 07/54618	GROUP OR UNIT 1518	ATTACHMENT TO PAPER NUMBER 7	
NOTICE OF REFERENCES CITED				APPLICANT(S) Egashira et al.			
U.S. PATENT DOCUMENTS							
*	DOCUMENT NO.	DATE	NAME	CLASS	SUB-CLASS	FILING DATE IF APPROPRIATE	
A	4683257	7-87	Kakiuchi et al.	524	908		
B	4556220	12-85	Tomina et al.	524	908		
C							
D							
E							
F							
G							
H							
I							
J							
K							
FOREIGN PATENT DOCUMENTS							
*	DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUB-CLASS	PERTINENT SHTS., DWG., PP., SPEC.
L							
M							
N							
O							
P							
Q							
OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)							
R							
S							
T							
U							
EXAMINER Yang S. Lee				DATE 6-27-91			
* A copy of this reference is not being furnished with this office action. (See Manual of Patent Examining Procedure, section 707.05 (a).)							



PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of :

Yoshinori EGASHIRA et al :

Application No: 07/521,618 :

Group Art Unit: 159 ✓

Filed: May 10, 1990 :

Examiner: Y. Lee

For: SOLID GOLF BALL :

AMENDMENT UNDER 37 C.F.R. 1.115

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

RECEIVED
OCT 08 1991
GROUP 150

Sir:

This Amendment is in response to the Office Action dated July 8, 1991, in the above-identified application, to which a response is due on or before October 8, 1991.

Please amend the application as follows:

IN THE CLAIMS:

Claim 1. (Twice Amended) A solid golf ball comprising a rubber composition containing 100 parts by weight of a base rubber selected from the group consisting of polybutadiene rubber, natural rubber, polyisoprene rubber and styrene-butadiene rubber, about 25 to about 40 parts by weight of an unsaturated carboxylic acid metal salt, about 0.05 to about 2 parts by weight of a sulfur compound selected from the group consisting of [an organic sulfur compound,] thiophenols and metal salts thereof, and thiocarboxylic acids and metal salts thereof. [and a metal-containing organic sulfur compound,] and about 0.5 to about 3 parts by weight of an organic peroxide.

D.C.

10-11-91

B1
Sub
D1

AMENDMENT UNDER 37 C.F.R. 1.115
U.S. Appln. No. 07/521,618

Please cancel claims 13 and 16, without prejudice or disclaimer.

In claim 14, please delete "13" and insert --1--.

In claim 15, please delete "13" and insert --1--.

32
10
3/13
Claim 17. (Once Amended) The ^{solid ball} golf claim of claim [13] 1, wherein said [metal-containing organic sulfur compound is selected from] metal is zinc [salts of said thiophenols and thiocarboxylic acids]. 1?

REMARKS

Review and reconsideration on the merits are respectfully requested.

Claim 1 has been amended as shown. Support for the amendment is found in canceled claims 13 and 16. The dependency of claims 14, 15 and 17 have been amended due to the cancellation of claims 13 and 16. No new matter has been added. Entry is requested.

On page 2 of the Office Action, claims 1 and 3-20 stand rejected under 35 U.S.C. §103 as being unpatentable over Isaac or Kakiuchi in view of Tominaga. For convenience, the Examiner's reasoning is set forth below.

Isaac (col. 2, lines 41-49) or Kakiuchi (abstract and Examples 1-6) disclose a composition for golf balls comprised of polybutadiene, an unsaturated carboxylic acid metal salt and an organic peroxide. The composition of the primary references differ from the instant invention in that it lacks a sulfur compound. However, Tominaga (col. 1, lines 31-50) teaches that golf balls made of a composition containing a polysulfide compound have improved rebound performance as well as hardness and durability. Thus, it would have been obvious to one of

AMENDMENT UNDER 37 C.F.R. 1.115
U.S. Appln. No. 07/521,618

ordinary skill in the art to incorporate the polysulfide compound of Tominaga into the composition of the primary references for the purpose of making golf balls having improved rebound performance as well as hardness and durability.

This rejection is respectfully traversed. Isaac or Kakiuchi, alone or in combination with Tominaga, do not disclose or suggest the present invention.

Isaac discloses a composition for making golf ball products which contain polybutadiene crosslinked by zinc diacrylate and the use of a free radical initiator. However, Isaac fails to disclose or suggest a sulfur compound as recited in Applicants' claim 1 as admitted by the Examiner. Further, there is no suggestion or incentive for one skilled in the art to use the teachings of Isaac to prepare a solid golf ball comprising a sulfur compound taught by the present invention.

Moreover, Kakiuchi does not disclose or suggest the present invention.

Kakiuchi discloses a solid golf ball comprising a polybutadiene, a crosslinking agent such as acrylic and methacrylic acid, an inorganic filler and an organic peroxide. However, Kakiuchi does not disclose or suggest a sulfur compound as recited in Applicants' claim 1 as admitted by the Examiner.

In addition, the secondary reference, Tominaga, does not disclose or suggest the present invention or supply the deficiencies of the primary references.

AMENDMENT UNDER 37 C.F.R. 1.115
U.S. Appln. No. 07/521,618

Tominaga teaches a solid golf ball comprising polybutadiene, metal salts of unsaturated carboxylic acid (e.g., zinc sulfur acrylate acid) and dicumyl peroxide, in addition to a polysulfide compound. However, Tominaga is restricted to certain sulfur compounds.

In the Background of the Invention section, Tominaga discloses that moderate hardness and durability are sought as well as a remarkably improved rebound performance (column 1, lines 31-35). However, previously, only moderate hardness and durability were achieved because a composition containing a monomer such as the metallic salt of an α,β -ethylenic unsaturated carboxylic acid, upon reaching a chain length which is too long, has a reduced rebound performance which also results when polybutadiene rubber is blended with other polymers (column 1, lines 19-30). Therefore, Tominaga discloses restricting its composition to certain sulfur compounds because it was found that "one group of sulfide compounds has a very superior performance as an agent for regulating the molecular weight of the grafted chain" (column 1, lines 36-40). The working examples of Tominaga also support the use of only certain sulfur agents. Thus, the sulfur agents for regulating the molecular weight are selected from the group consisting of 2-(4-morpholinylthio)benzothiazole, 4,4'-dithio-bis-dimorpholine, dipentamethylenethiuram tetrasulfide and derivatives thereof (Summary of the Invention, column 1, lines 43-50).

AMENDMENT UNDER 37 C.F.R. 1.115
U.S. Appln. No. 07/521,618

Notably, sulfur agents taught in Tominaga differ from those recited in Applicants' amended claim 1 since Applicants recite thiophenols and metal salts thereof and thiocarboxylic acids and metal salts thereof. Thus, Tominaga does not disclose or suggest a solid golf ball with the components as recited in Applicants' claim 1 and, furthermore, a combination with the primary references, even if proper, would not disclose or suggest the present invention or render the present invention obvious.

An essential aspect of the present invention is the incorporation of a specific sulfur compound as recited in Applicants' now amended claim 1. None of the references, alone or in combination, disclose or suggest this feature. Thus, a prima facie case of obviousness has not been set forth. In the alternative, even if a prima facie case of obviousness could be alleged, the comparative experimentation in the present specification (see Tables 1 and 2 on pages 7-8) as well as the data in the Declaration filed on April 12, 1991 illustrate the unexpectedly superior results achieved by the present invention upon the use of the specific sulfur compounds recited in Applicants' claim 1, in particular with respect to improved initial velocity and flying performance.

Accordingly, withdrawal of the outstanding rejection under §103 is respectfully requested.

AMENDMENT UNDER 37 C.F.R. 1.115
U.S. Appln. No. 07/521,618

On page two of the Office Action, claims 1 and 3-20 stand rejected under 35 U.S.C. §102(b) as anticipated by Tominaga. For convenience, the Examiner's reasoning is set forth below.

Tominaga (Table 1-3) discloses a composition for golf balls comprised of polybutadiene, an unsaturated carboxylic acid metal salt, a polysulfide compound and an organic peroxide. The instant invention clearly reads on the Tominaga reference, and thus lacks novelty.

This rejection is respectfully traversed.

As argued above, Tominaga does not disclose or suggest the present invention. In order for the present invention to be anticipated by the Tominaga reference, each and every aspect of the present invention must be taught or suggested in the reference. Tominaga does not disclose or suggest the particular sulfur compounds recited in Applicants' claim 1. Tominaga is restricted to specific sulfur compounds. Applicants' claim 1 does not read on or overlap with the sulfur compounds taught by Tominaga.

Furthermore, for this reason, Tominaga does not render the present invention obvious. Tominaga does not teach or suggest the sulfur compounds recited in Applicants' claim 1 nor appreciate the unexpectedly superior results achieved by the use of these compounds since Tominaga is restricted to very particular sulfur compounds to achieve a specific goal.

Accordingly, withdrawal of the outstanding rejection under §102(b) is respectfully requested.

AMENDMENT UNDER 37 C.F.R. 1.115
U.S. Appln. No. 07/521,618

All claims should now be in condition for allowance. Early indication of allowability is respectfully requested. Should any minor points remain prior to issuance of a Notice of Allowance, the Examiner is requested to telephone the undersigned at the below listed telephone number.

Respectfully submitted,

Mark Boland

Mark Boland

Reg. No. 32,197

SUGHRUE, MION, ZINN, MACPEAK
& SEAS
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037
(202) 293-7060 *613-7444*

Date: October 8, 1991


**UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office**

 Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
07/521,618	05/10/90	EGASHIRA	Q23105

EXAMINER
LEE, Y

 SUGHRUE, MION, ZINN, MACPEAK & SEAS
2100 PENNSYLVANIA AVE., N. W.
WASHINGTON, DC 20037

ART UNIT	PAPER NUMBER
1511	9

DATE MAILED: 12/11/91

 This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

☐ This application has been examined ☒ Responsive to communication filed on 10-8-91 ☒ This action is made final.

 A shortened statutory period for response to this action is set to expire 3 month(s), — days from the date of this letter.
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

- | | |
|---|---|
| 1. <input checked="" type="checkbox"/> Notice of References Cited by Examiner, PTO-892. | 2. <input type="checkbox"/> Notice re Patent Drawing, PTO-848. |
| 3. <input type="checkbox"/> Notice of Art Cited by Applicant, PTO-1448. | 4. <input type="checkbox"/> Notice of Informal Patent Application, Form PTO-152 |
| 5. <input type="checkbox"/> Information on How to Effect Drawing Changes, PTO-1474. | 6. <input type="checkbox"/> _____ |

Part II SUMMARY OF ACTION

 1. ☒ Claims 1, 3-12, 14-15 and 17-20 are pending in the application.

Of the above, claims _____ are withdrawn from consideration.

 2. ☐ Claims _____ have been cancelled.

 3. ☐ Claims _____ are allowed.

 4. ☒ Claims 1, 3-12, 14-15 and 17-20 are rejected.

 5. ☐ Claims _____ are objected to.

 6. ☐ Claims _____ are subject to restriction or election requirement.

 7. ☐ This application has been filed with informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.

 8. ☐ Formal drawings are required in response to this Office action.

 9. ☐ The corrected or substitute drawings have been received on _____. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable; ☐ not acceptable (see explanation or Notice re Patent Drawing, PTO-848).

 10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on _____, has (have) been ☐ approved by the examiner; ☐ disapproved by the examiner (see explanation).

 11. ☐ The proposed drawing correction, filed _____, has been ☐ approved; ☐ disapproved (see explanation).

 12. ☐ Acknowledgement is made of the claim for priority under U.S.C. 119. The certified copy has ☐ been received ☐ not been received ☐ been filed in parent application, serial no. _____; filed on _____.

 13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.

 14. ☐ Other

EXAMINER'S ACTION

Serial No. 07/521618

-2-

Art Unit 1511

The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Claims 1, 3-12, 14-15 and 17-20 are rejected under 35 U.S.C. § 103 as being unpatentable over Tominaga or Isaac or Kakiuchi in view of Verhanc et al.

Each of the above primary references discloses a composition for golf balls comprised of polybutadiene, an unsaturated carboxylic acid metal salt and an organic peroxide. See Isaac (column 2, lines 41-49); Kakiuchi (abstract and Examples); Tominaga (Tables 1-3). The composition of the above primary references differs from the instant invention in that it lacks a sulfur compound as recited in the instant claims. Verhanc et al. (column 1, lines 31 through column 2, line 13 and claim 1), however, teach that the processability of elastomers (e.g., polybutadiene) is improved when a zinc salt of an aromatic

Serial No. 07/521618

-3-

Art Unit 1511

mercaptan of the benzene and naphthalene series is incorporated into said elastomers. Thus, it would have been obvious to one of ordinary skill in the art to incorporate the zinc salt of an aromatic mercaptan of the benzene and naphthalene series of the secondary reference into the composition of the primary references for the purpose of obtaining the advantages as set forth in the secondary reference.

Applicant's amendment necessitated the new grounds of rejection. Accordingly, THIS ACTION IS MADE FINAL. See M.P.E.P. § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 C.F.R. § 1.136(a). The practice of automatically extending the shortened statutory period an additional month upon the filing of a timely first response to a final rejection has been discontinued by the Office. See 1021 TMOG 35.

A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS FINAL ACTION IS SET TO EXPIRE THREE MONTHS FROM THE DATE OF THIS ACTION. IN THE EVENT A FIRST RESPONSE IS FILED WITHIN TWO MONTHS OF THE MAILING DATE OF THIS FINAL ACTION AND THE ADVISORY ACTION IS NOT MAILED UNTIL AFTER THE END OF THE THREE-MONTH SHORTENED STATUTORY PERIOD, THEN THE SHORTENED STATUTORY PERIOD WILL EXPIRE ON THE DATE THE ADVISORY ACTION IS MAILED, AND ANY EXTENSION FEE PURSUANT TO 37 C.F.R. § 1.136(a) WILL BE CALCULATED FROM THE MAILING DATE OF THE ADVISORY ACTION. IN NO EVENT WILL THE STATUTORY PERIOD FOR RESPONSE EXPIRE LATER THAN SIX MONTHS FROM THE DATE OF THIS FINAL ACTION.

Any inquiry concerning this communication should be directed to Yong S. Lee at telephone number (703) 308-4354.

Serial No. 07/521618

-4-

Art Unit 1511

YSC
Yong S. Lee
November 22, 1991

Paul R. Michl
PAUL R. MICHL
SUPERVISORY PATENT EXAMINER
ART UNIT 156

TO SEPARATE, HOLD TOP AND BOTTOM EDGES, SNAP-APART AND DISCARD CARBON

FORM PTO-892 (REV. 3-78)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		SERIAL NO. 07152164	GROUP ART UNIT 1511	ATTACHMENT TO PAPER NUMBER 9			
NOTICE OF REFERENCES CITED				APPLICANT(S) Egashira et al.					
U.S. PATENT DOCUMENTS									
		DOCUMENT NO.	DATE	NAME	CLASS	SUB-CLASS	FILED DATE IF APPROPRIATE		
A		2467789	4-49	Verbanc et al.	524	382			
B									
C									
D									
E									
F									
G									
H									
I									
J									
K									
FOREIGN PATENT DOCUMENTS									
		DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUB-CLASS	PERTINENT SHTS. DWG.	PP. SPEC.
L									
M									
N									
O									
P									
Q									
OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)									
R									
S									
T									
U									
EXAMINER Gong S. Lee				DATE 11-22-91					
* A copy of this reference is not being furnished with this office action. (See Manual of Patent Examining Procedure, section 707.05 (a).)									



110. -115
1546
AF
BOX AF

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#10/8m
RECEIVED

In re the Application of:

EGASHIRA et al

Application No: 07/521,618

Group Art Unit: 1511

Filed: May 10, 1990

Examiner: Lee, Y.

For: SOLID GOLF BALL

APR 20 1992
GROUP 150

PETITION FOR EXTENSION OF TIME UNDER 37 C.F.R. §1.136

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

Pursuant to 37 C.F.R. §1.136, Applicants hereby petition for an extension of time of one month, extending the time for responding to the Office Action dated December 11, 1991 to April 13, 1992 (since April 11, 1992 is a Saturday).

A check for the statutory fee of \$110.00 is attached. Please charge any additional fees under 37 C.F.R. §1.16 or §1.17 necessary to keep this application pending in the Patent and Trademark Office or credit any overpayment to Deposit Account No. 19-4880. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

Mark Boland
Mark Boland, Esq.
Registration No. 32,197

060 MC 04/16/92 07521618
SUGHRUE, MION, ZINN,
MACPEAK & SEAS
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3202
(202) 293-7060

Date: April 13, 1992



IN THE U.S. PATENT AND TRADEMARK OFFICE

#11/8m
104.229

APPLICANT : Yoshinori EGASHIRA et al
SERIAL NO.: 07/521,618
FILED: May 10, 1990
FOR: SOLID GOLF BALL
GROUP: 156
EXAMINER: PAUL R. MICHL

DECLARATION

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir,

I, Yoshinori EGASHIRA, a citizen of Japan
and a resident of No. 6-6, Musashidai 7-chome,
Hidaka-machi, Iruma-gun, Saitama-ken, Japan
do hereby declare that:

1. I was graduated from Kurume College of
Technology, Japan in March, 1975. Since April
1975, I have been employed by Bridgestone
Corporation, the assignee of the above-
identified application. I have been engaged in
research and development in the field of golf
balls.

2. I am one of the named inventors of the above-identified application and hence, am familiar with the subject matter disclosed in said application.

3. In order to show the feature of the present invention, I conducted the following experiments.

[Experiment]

Rubber compositions were prepared by blending the ingredients shown in Table 1. Two-piece golf ball solid core having a diameter of 38.4 mm were prepared by molding the composition in a mold and vulcanizing at 155°C for 20 minutes.

The balls were measured for hardness and rebound resilience. The hardness of the balls was measured as deflection (in mm) under a load of 100 kg. The initial velocity (in m/sec.) of the balls was measured by a hitting test according to the USGA standard in which the balls were hit at a head speed of 38 m/sec. using a hitting machine of the fly wheel type. The rebound property of the balls was measured as a distance of rebound by dropping the balls from a height of 120 cm.

The results are shown in Table 1.

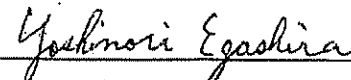
As is apparent from the results, a ball comprising a rubber composition containing a base rubber, zinc salt of pentachlorothiophenol as a sulfur compound without zinc acrylate as an unsaturated carboxylic acid metal salt can not give improved rebound property. Further, using 2-(4-morpholinylthio)benzothiazole instead of pentachlorothiophenol as a sulfur compound, the ball cannot give an improved rebound property and the hardness is reduced.

Table 1

Core composition (pbw)	No. 1	No. 2	No. 3	No. 4	No. 5
IR	10	10	10	10	10
BR	90	90	90	90	90
Zinc acrylate	32	32	32	—	—
Zinc oxide	21	21	21	21	21
Antioxidant	0.2	0.2	0.2	0.2	0.2
Dicumyl peroxide	1.0	1.0	1.0	1.0	1.0
zinc salt of pentachlorothiophenol	—	0.2	—	0.2	—
2-(4'-morpholino-dithio)benzothiazole	—	—	0.2	—	—
Ball properties					
Hardness (JIS-C)	77	76	72	12	14
Deflection under a load of 100 kg (mm)	2.83	3.05	3.13	—	—
Rebound property (cm)	100.8	101.7	100.8	86.5	90.6
Initial velocity	72.80	72.96	72.58	—	—

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated this 6th day of April, 1992


Yoshinori EGASHIRA